Henry G. Hanks

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San Francisco, Cal., 1901.

J. C. Branner Co

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By

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The Deep Lying Auriferous Gravels and Table Mountains of California

By Henry G. Hanks, F. G. S.

San Francisco, California
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The object of this paper is not to disprove the opinions of others, but to record some of the results of my study of a very interesting subject, and perhaps to add something to a controversy still claiming the attention of geologists.

It has not been written at random, but by request from a source worthy of consideration, at a time when I had the leisure and inclination to comply, and I have selected from a gathering of many years such facts and theories as I thought might be of general interest.

The placer gold mines of California are by nature divided into two general classes, the shallow and the deep; the former were first discovered and worked; when the gold crop diminished, prospecting tunnels were driven into low "table mountains," revealing extensive and rich deposits; and a new system, called "drift mining," followed. Some of these adit levels were more than a mile in extent. In many cases shafts were sunk from the surface several hundred feet in depth, from the bottom of which tunnels were driven in search of gold.

These tables cover strata of undoubted sediments varying in texture from bowlders weighing tons, to silts, so finely divided that they will not wholly settle in still water for several days. These are the "auriferous gravels" described by Professor Whitney and others. Since the discovery of gold in them they have been called "deep placers," in contradistinction to "shallow" or surface placers; under table mountains, they have remained intact since the time of their placement. Elsewhere, not so protected, they have been subjected to more recent vicissitudes of nature, uncovered in places and again buried, crosscut by cañons born of mountain torrents, shifted and disturbed many times until they have somewhat lost their original character, the result of which is the shallow placers from which so vast an amount of gold has been gathered by panning, by ground sluicing, and finally by hydraulic washing.

I find the following among my historical notes: "In 1852 Mr. A. Bateman, in Tuolumne county, was engaged in placer mining; he and associates followed outcropping gravel under Table Mountain and discovered a dipping rim rock. He believed this tunnel to be the first one driven."

What are known in California as table mountains are remains of "mesas," so-called by the Spaniards, from which the California name is probably derived. They were once continuous plains. Natural erosion has made deep excavations in some parts; the flat intact portions remain, capping low summits, now elevated table mountains. Seen from a distance these flat summits terminate at one or both ends in a mural cliff, at the base of which a talus of fallen debris slopes at a sharp angle to recent plains below.

Table Mountain of Tuolumne county, the first which attracted attention, lies about two miles from Sonora, and extends in a continuous irregular line, bearing nearly northeast by southwest, nine miles in length; it is in no part quite half a mile wide. There are others lying not far distant, two of which are each about six miles long and nearly one mile wide. The entire group—thirteen in number—as figured on Professor Whitney's map, all lying in the same general direction, extend twenty-four miles, and their aggregate area is eighteen square miles, very nearly.

Oroville Table Mountain, in Butte county, extends from Oroville to Cherokee Flat, a distance of about six miles. Its extreme width is nearly four miles, and its area, including South Table Mountain, is about nine square miles. There are many other outlying, isolated table-capped summits at irregular distances from the principal one, all having the same general altitude and character.

The capping is from one hundred to one hundred and fifty feet in thickness, with a grade, surface and bed-rock of one hundred feet to the mile. These cappings are generally thought to be volcanic and are called lava; in describing them I shall use this name by which they are universally known, until I endeavor to show that they may be of a very different character.

The hills near Oroville are so generally lava-capped that it would seem that the sheet was at one time an elevated table land covering a more considerable area.

The rock material of which these table mountains are composed is of such a character that its origin is difficult to trace even when long and carefully studied. These rocks are not peculiar to California, for they exist in many other parts of the earth, notably in France, Germany and Italy, where they have been carefully examined by active and energetic observers, some of whom have published elaborate works much read, and often quoted in more recent geological text-books; they are generally classed as igneous plutonic.

Some geologists are of the opinion that lava forming the surface of the Tuolumne table flowed from the high Sierra beyond the Big Trees, a distance not far from sixty-five miles east, and that

PLATE 2. [Scale 5/6.]

the Oroville mesas are lava from Lassen Butte, lying about the same distance north.

During many years study of these rocks I have found reason to believe that they may not be volcanic, but metamorphic sediments. This statement is so at variance with the general opinion of modern geologists that I make it with diffidence. Among geologists of the first half of the last century, this idea in connection with similar rocks was not rare, otherwise there would have been no Neptunists, no Hutton-Werner controversy.

The term volcanic, derived from Vulcan, the God of fire, should be applied only to rocks known to have flowed in a liquid state from a crater, which is not true of those of the table mountains. I have made many meltings of different varieties in new crucibles without fluxes, and am convinced that they have either never been in a state of fusion, or are now in a highly metamorphic condition. Two important discoveries since made confirm my opinion that the so-called lavas are really sedimentary; one is the impression of a pine cone, the other solfataric steam pipes, which seem at least to indicate that these rocks were at one time not only plastic but also nearly fluid.

It is thought by some geologists that rocks of this character were formed at the bottom of the sea and that water prevented them from being igneous volcanic; others propose a theory that they are volcanic ashes, which fell in the distant past, when conditions existed under which volcanoes on a grander scale were more numerous than at present. Still another school of geologists hold that they were squeezed out of the earth through accidental fissures by pressure. According to this theory they were then unaltered sediments which had in a measure been protected by more recent overlying strata. These assumed outbursts have been called massive eruptions; the matter of which they are composed is immeasurably greater than that from any known ignivomous mountains, which, when compared to the earth's surface and crust, are but few, insignificant, and unimportant.

These rocks, although in some cases crystalline, sometimes contain fossils, both animal and vegetable. A specimen of diorite was sent to me some years ago from New Zealand, in which a large fossil pecten was imbedded; if this rock were igneous the presence of such a fossil would seem impossible.

T' 's is not exceptional, for other instances have been met with elsewhere. Daubeny, describing basalts and other rocks in the south of France, supposed to be volcanic, says: "As we trace it downward it is seen to pass into a very crystalline greenstone and covered by amygdaloidal wacke, the cells inclosing calcareous matter; shells

are also contained in this formation and serve to connect it still more closely with the limestone covering it." *

Kirwan, in his Geological Essays, says: "Breckman found mussel shells, ammonites and corallites in basalt of the pretended extinct volcanoes of France, and Baron Ash has presented to the museum of Göttingen a number of shells filled with striated, shining horn-blende, found in the Crimea." †

It was a custom of Robert Jameson frequently to visit Salisbury Crags with his students, to show them the fallacy of ascribing to the basalts an igneous origin; for which he was severely criticised by geologists holding a different opinion.

A gentleman of much mining experience in California informed me that in 1888 he saw in the Mountain Gate Drift Mine at Damascus, Placer County, at the end of the tunnel,—which is more than a mile in length, and six hundred feet beneath the surface of the mesa,—the trunk of a tree standing vertically and wholly imbedded in so-called lava. There was no sign of charring or burning.

The impression of a pine cone before mentioned (‡) is so perfect that when liquid plaster of Paris is poured in, casts are obtained showing the exact form of the cone. Be it natural or otherwise, it clearly shows that the matrix was not only cold but plastic and even semi-fluid, for the finest striations and sculpture are shown. It was found, as I am informed, at or near the Aurora Drift Mine, Magalia, Butte county; a careful examination shows it to be what it seems, a rock similar to those of Table Mountain, and I have, during a possession of nearly twenty years, failed to discover any sign of artificial origin. Before I became fully convinced, I made an analysis which shows it to be nearly identical in composition with some of the trachytes so common in California. I have placed this analysis with one of surface rock from the Oroville Table Mountain, for comparison.

Another reason to doubt the volcanic origin of these rocks is the discovery of what seem to be solfataric steam pipes formed when sediments were in a plastic condition, near the mouth of Chico Cañon, Butte county, where I was surprised to find on the talus, blocks of stone of the trachyte type, pierced with cylindrical perforations, in diameter from that of goose quills to several inches; these stones were once parts of the surface of the mesa. § The perforations extended quite through the blocks—in some cases five feet. In my opinion such pipes could not be formed in lava, liquid or cold.

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* Description of Active and Extinct Volcanoes, etc. London, 1826; fol. 44.
† Fols. 251-252.
‡ Plate 2.
§ Plate 3.

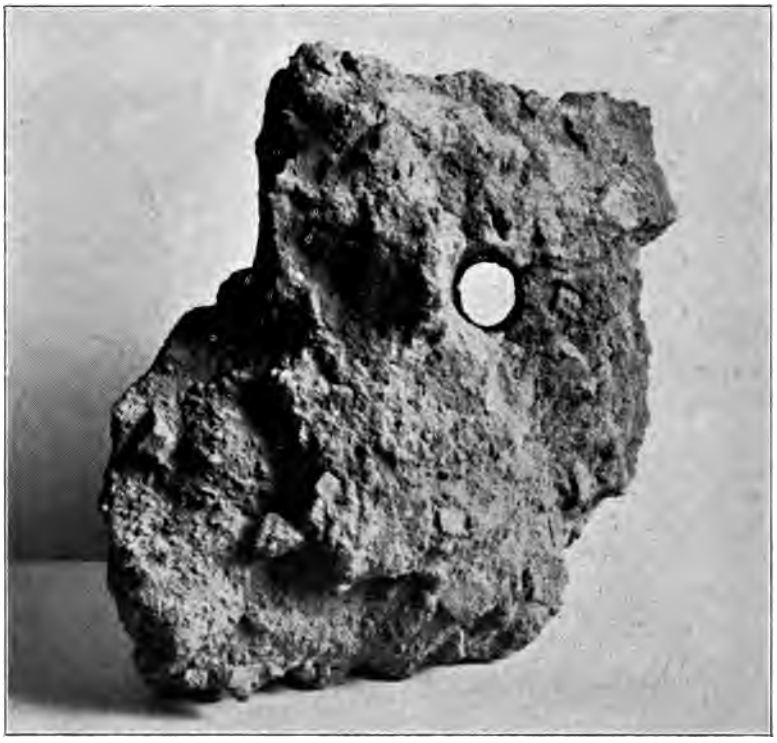

PLATE 3. [Scale ⅓.]

I have seen similar ones at the still active mud volcanoes in San Diego county.

Chico Cañon, not far from the town of Chico, extends three miles in a northeasterly direction and deeply cuts the table plateaus, leaving them intact on both sides. This cañon, which has been placer-mined and re-mined several times, has a floor of loose and compacted gravel and conglomerate, the latter in many cases in immense bowlders. There seems to be no reasonable doubt that this cañon was excavated after the formation of the bowlders, which indicates a long but indefinite period. The tables lie at a low altitude approximating two hundred feet above Chico, which itself is one hundred and fifty feet above sea level. They occur at irregular intervals but seem all to be members of the same system.

Igneous lavas are simply common rocks made liquid by heat, without material change of character or composition. Volcanic ashes are also common rocks pulverized mechanically without fusion in the throat of a volcano, and winnowed by atmospheric currents.

Lava flows, ancient and recent, are generally narrow, and limited in extent to a few miles. The longest flow of Vesuvius does not exceed seven miles, Ætna twenty, Hawaii thirty, and Hecla fifty. Lava flows very slowly; on a steep incline near its source, one mile per hour; at a short distance, perhaps an average, three hundred yards per hour, and at a distance of several miles, twenty yards in twenty-four hours.

Congealed lava cannot flow; as it cools it is retarded or wasted on the route; if on a steep grade it piles on itself and forms ridges and corrugations; it cannot assume water levels and is never smooth as we find the table mountains to be, and there are no great volcanoes in California to which the table mountains might claim relationship.

Known mineral species number about one thousand; they are generally found in crystals or small masses, the exceptions being rare. Rocks are mechanical mixtures of individual minerals.

The first classification of rocks was simple, being a division into two groups, primary and secondary, the latter differing from the first by containing fossil remains. Werner added a third which he named transition; still later the system was augmented by a fourth, alluvial. These were assumed to include all shades of difference, and to my mind composed a better system than the present.

Modern lithologists claim an accuracy in the determination and classification of rocks which does not exist, much of the minutia being ideal or superfluous. For confirmation of this opinion I refer

to a paper, "The Rocks of the Fortieth Parallel," published in the Proceedings of the Boston Society of Natural History, Vol. XXII, October 3, 1885. No two rocks are exactly alike, nor are different parts of the same rock identical.

Professor J. W. Judd, F. R. S., and President of the Geological Society of London, in his anniversary address, said: "A system of 'lithology' may indeed be devised if we confine our attention to the hand specimens in our museums; but it breaks down the moment that we attempt to apply it to our researches in the field." *

When Democritus, Theophrastus, Mucianus, Avicena, Savonarola, Vives, Cardan, Tournefort and others expressed the opinion that certain stones give birth to young, they were nearly right, for minerals are continually changing to others, but not directly reproducing the same species. In the south and west, fifty years ago, bowlders were frequently called "land seeds" from the same idea.

As the result of my studies in the field and laboratory I am satisfied with three general divisions in the classification of rocks: the crystalline, the sedimentary, and the metamorphic; for I hold the present opinion that the first and second, like minerals, are constantly interchanging, and that the third includes every intermediate condition of mineral matter. The first stage of the passage to crystalline rocks is the formation of individual crystals of mineral species, which are evolved from the heterogeneous sediments; these endure for a time and decay, as animals and plants live and die. Our physical existence would be impossible were it not for incessant change.

In my collection cases, minerals have been visibly exchanging elements for years in accordance with the laws of nature, which I have watched with great interest.

Near the Golden Feather Placer Mine in Butte county, near Oroville, the rocks are exposed from the cemented, hard, auriferous conglomerates, to the top of the Table Mountain; if not in perfect geological section they at least furnish specimens seeming to represent a gradual transformation from unaltered gravels to superficial andesites, diorites, cellular porphyries and trachytes. Such a collection, which I have, is an interesting study; some specimens which resemble andesite show on close inspection imbedded unaltered pebbles. Some of these rocks are polar-magnetic with greater or less degree of intensity. I discovered this by accident, and have since found it not uncommon. Some of the surface rocks show orbicular structure, as if changed from pebbles, small bowlders or concretions.

* Proc. Geol. Soc., Vol. 43, 1887, fol. 75.

I have a specimen of argillaceous shale, the typical bed-rock of the Shaw mine, and others at Indian Creek, El Dorado county, containing an imbedded blue quartz pebble, which seems to prove its sedimentary origin.

A physical and chemical examination of superficial rocks composing the Oroville Table Mountain, shows some of them to be cellular, others brecciated, while still others are compact; chemically they do not differ materially. The compact variety free from cells I thought might be in transition toward the Gibsonville andesites which it resembles; examined in section microscopically it has the appearance of fine grained diorite.

A particular specimen examined was thought to be an average. It presents a cellular, porphyritic, amygdaloidal appearance, some of the cells being filled with a white, soft, almost gelatinous mineral, and the surface of the cavities is darker than the interior. The specific gravity in mass is 1.85—in powder 2.45. Dull; color light brown; streak unchanged; hardness 2.5; decomposed by boiling nitro-hydrochloric acid; fuses before the blowpipe on edges and becomes magnetic; yields water in closed tube; by Szabo's flame test gives sodium reaction, but shows no potash.

ANALYSES.

	1	2
Silica	48.85	55.06
Lime	5.90	8.14
Alumina	8.17	6.70
Sesquioxide of iron	24.33	21.27
Magnesia	2 26	4.03
Water	5.10	3.00
Undetermined	5.39	1.80
	100.00	100.00

No. 1 is the above described specimen from the Oroville Table.

No. 2 the rock inclosing the impression of a pine cone.

Some of the rocks on the tables above Chico Cañon contain olivine, which is considered characteristic of basalt.

How and when the deep gravels were deposited, early became a subject of universal interest, not only to miners but also to scientific men. It was at first generally assumed that unusual forces were at one time active and instrumental; it requires some effort to overcome an inborn disposition to magnify simple conditions. The miners imagined that the earth was then in an abnormal state; storms were more violent; there were violent earthquakes and great floods. After rivers had deposited bowlders in their channels and covered them with sands, silts and pipe clay, superabundant volca-

noes poured out lava streams which flowed many miles to form the table mountains. It was nothing strange to them that after nature had produced the deep auriferous gravels she should protect them for future miners by the aid of many industrious volcanoes.

I began the study of these deposits many years ago and became convinced that on the contrary they are the result of long continued, slow work of nature, not differing materially from that now in operation on some parts of the earth's surface, and in no way cataclysmal.

Ever since the deep gravels were discovered in California and began to yield their gold, geologists have searched for evidence of the co-existence of man. It soon began to be talked that if human beings lived at the time they were deposited, some remains of them might be found. This idea may have originated with the miners, among whom were some of the most intelligent and educated men that the world could produce; this was notably the character of many of those who first came to California to seek gold. Scientific men among them became interested, and sought and gathered everything bearing on the subject. The miners were very observant; they drew inferences, formulated theories, compared notes, debated, and often expressed ideas and conclusions which editors were glad to publish in local newspapers; this served to increase the interest, and when they found anything unusual in the shafts and drifts they laid it aside, and at night brought it to their camp or cabin; these frequently found their way to bar-rooms and hotels, where it was almost universal to find displayed collections of local ores, minerals and curiosities; the history of their discovery and locality was frequently either lost or confounded with that of others.

Dr. P. Snell, an old-school geologist, first began scientific investigation. He gathered a large and valuable collection of interesting specimens. Born in Vermont, he came to California in 1850, and settled at Sonora, Tuolumne county. He died at his home in Sonora in 1870, aged eighty-seven years.

The most common organic remains found in the shallow placers and hydraulic banks are vegetable, the trunks and leaves of trees; the wood is generally wholly silicified, less frequently whole trees changed to lignite are met with. The bones of animals are of rare occurrence.

When arrowheads, pottery and other works of man were found in the talus of the Enchanted Mesa in Western New Mexico, it was generally conceded that they fell from the surface of the table mountain, but in California similar discoveries were erroneously assumed to be in place.

PLATE 4. SERPENTINE PERFORATED BY PHOLADIDAE.

Human remains and implements, supposed to be prehistoric, have been found in river beds in California many times, and on the bedrock of hydraulic mines, but this does not by any means prove that they were placed there by man. On the contrary it may be assumed that they were used and left on the recent surface and fell to the bedrock as the banks were piped away in the course of mining by that well known process. As bullets, shot, old nails and small hardware of the mining camps gravitated to the sluices and were found with the gold, so recent and possibly ancient stone implements piped out of the banks and from the surface were found and collected as curiosities. Instances have been recorded and seemingly substantiated in which they have been taken out of the auriferous gravels, but always, as far as I can gather, from shallow placers or beneath a talus, not in undisturbed, lava-capped gravels of the glacial channels; all beyond which is recent sedimentary and secondary, the ancient and modern being mixed mechanically.

I have been unable to obtain positive proof of the discovery of any implements used by man in gravels covered by so-called lava, or human remains in auriferous deposits in place in any part of California; I have for years kept this matter in view, and eagerly sought information when discoveries were announced; but have met with an insurmountable doubt when the evidence was carefully investigated. The same uncertainty applies to discoveries made at the bottom of vertical shafts, for surface objects may accidentally fall or be thrown into them purposely.

There are numerous sources of error met with in these investigations; miners, collectors, and even scientific men are sometimes led into a bias by a desire to confirm a favorite opinion. The average prospector is influenced by his business to be over credulous; his whole time is passed in looking for something he is continually hoping to find, and he is sometimes apt to anticipate his discoveries; a resemblance real or fancied, to his excited imagination, makes an object what it happens to be like. One who has the opportunity to examine miner's collections will often see objects misnamed; it is common to find them labeled "petrified frogs," "potatoes," "onions," tomatoes," etc. I recall many instances. One miner was quite offended because I expressed doubt as to a "petrified human foot." There is an object in the museum of the State Mining Bureau sent as a prehistoric hatchet, because of a slight resemblance to such a tool.

Silicified wood has been mistaken for fossil ivory in at least one case, for I had a fine specimen in my collection for years, which I never doubted was a portion of a fossil tusk, until, in the course of

study, I subjected it to chemical and microscopical examination and found it to contain no organic matter, and that it was part of a silicified coniferous tree.

I have in my collection a fragment of a conglomerate bowlder from an auriferous, hard cement mine in Calaveras county, inclosing what at first sight seems to be lignite, but when it failed to deflagrate with nitrate of potash, I examined it more closely and found it to be a form of limonite. This specimen would deceive an observer who judged from appearance only.

There is no question that counterfeiting antique objects, curiosities and works of art is extensively practiced the world over. A Manchester mechanic can make a scarabee as well as could an ancient Egyptian, and successfully imitate their small work if supplied with genuine models. In 1872 a man was pointed out to me in London known as "Stone Jack;" he became a skillful maker of rude stone implements, which he sold to the British Museum and collectors; the introduction of his work caused some confusion, as it was difficult to distinguish between the genuine and counterfeit. Similar frauds have been practiced in California.

Perforated rocks are frequently if not generally assumed to be the work of human hands, but I have met with sufficient evidence to convince me that there may be many exceptions.

In 1772 Thomas Pennant found a belief prevalent in Scotland that "a naturally perforated pebble was an infallible cure for a horse that was hag ridden or troubled with nocturnal sweats." *

Spallanzani quotes M. Andria as follows: "In some places near the sea shore (of Ischia) are found rocks full of holes made by pholades; at least I am of the opinion that they are to be attributed to those animals, though I did not find in them any fragments of their shells." †

Rocks on the California sea coasts are frequently found bored by pholadidae, and strangely, rocks of entirely different character, including compact asphalt. Plate 4 is an example of this character.

Other perforations are made by concretions or fossils; still others by the weathering of soft minerals in a hard matrix. Plate 5 shows two specimens, both from the same locality, one perforated and the other revealing the cause, inclosing what seems to be a concretion, not a fossil, although it effervesces slightly with acids. The perforation or lacuna in the first mentioned is assumed to be caused by the weathering of a similar concretion; the locality is Feather Fork, Butte county. Another locality where perforated stones are natur-

* Second Tour in Scotland: Pinkerton's Voyages and Travels. Vol. III; fol. 209.
† Travels in the Two Sicilies; London, 1798. Vol. I: fol. 177.

PLATE 5. PERFORATION CAUSED BY CONCRETION. [Scale ½.]

ally formed is Chico Table Mountain; these have been described. Any of these rocks, however perforated by nature and worn by subsequent surface agencies, may be mistaken for the work of human hands.

Natural concretions and weather worn rocks sometimes assume singular shapes, and are not infrequently thought to be fashioned by man. In 1885 I saw in San Francisco what appeared to be a rude stone axe partly imbedded in a basaltic matrix. I was informed that it was found on the flank of Mount St. Helena; about the projecting part a groove had been cut which seemed to indicate that this putative implement was artificial, and by inference, that man existed when the rock was in a plastic or igneous state; but I noticed, with suspicion, that no part of the groove was imbedded. Deeming it worthy of investigation, I visited the locality and met the finder at the toll-house station on the mountain, 250 feet above sea level, who showed me the locality near by; he said it was found lying on the surface. Although at first incredulous, I soon found similar ones, some imbedded in the rock while others were free. It may be superfluous to add that all were minus the grooving, which seems to have been a modern afterthought. Specimens of the imbedded ones may be seen in the museum of the State Mining Bureau, numbered 6528.

That basaltic rocks frequently assume nodular forms is well known; that they sometimes loosen, weather out, and then resemble prehistoric implements was here demonstrated. The question naturally followed, may not many so-called "pestles," "phallic emblems," "badges of authority," etc., preserved in collections, be naturally formed in this manner?

The genesis of the beautiful orbicular diorite has, I believe, never been satisfactorily explained. I thought perhaps the same laws which produced these concretions may have been instrumental, the more so as napoleonite has been found in Placer county, California.

I recently became possessed of an unusually interesting object. At first sight it was a well constructed stone hammer of pronounced palaeolithic type, which for a time I believed it to be. * It was found in a bag of crude sand asphaltum in one of the streets of San Francisco on which an asphalt pavement was being laid.

Its weight is 2.68 kilos; its extreme length eighteen centimeters and the diameter of the largest ball eleven centimeters.

Several months later some small concretions were sent to me, some of which were miniature counterparts of my stone hammer;

* Plate 6.

they had the same dumb-bell shape and rough surface, which led me to re-examine the latter; and I soon became convinced that all had the same natural origin, including the gigantic one, which I am now sure is natural; nevertheless it could be used as a hammer for some purposes, and perhaps primitive man may have taken the idea of such an implement from similar concretions.

The small ones, which do not exceed twenty-five millimeters in length, while the least are about the size of peas, were brought up in the sand pump from a depth of eight hundred feet, in an oil well being sunk by the Bonanza King of Oil City Company, in Fresno county. It is clear to me that only small ones could reach the surface by this route, for the sand pump could not lift large ones; so we may assume that some as large as my specimen may be present at that depth, possibly in great plenty. I made comparative chemical tests and partial analyses, and found them to be nearly identical, the difference being that the small ones contained more iron. They were not quartz sand as appearance indicated, but the microscope revealed three distinct minerals resembling quartz, feldspar and hornblende. What I thought might be feldspar was in a porphyritic condition; both contained more than traces of mineral hydrocarbon, which, after I had recovered from my surprise, I concluded was superficial and due to environment, for petroleum is common in this class of rocks; both showed the presence of the alkalies by Szabo's test. A critical examination of the large specimen revealed no indication of wear by use, and I am convinced that it is exactly as nature made it.

The following are physical features of the small nodules: Exterior, rough; color, dark brown; interior, granular; light gray with obscurely concentric rings of limonite; streak pale yellow; by heating, change to blood red and become magnetic; infusible. In closed tube first gives water, then a vapor of petroleum, and on continuation of the heat a pale amber colored oil condenses in the upper part of the tube. While they seem fine grained sandstone, the microscope shows them to be composite and more like arkose; an attempt to make sections failed, because although hard they are extremely brittle, but by suspending the powdered mineral in damar I was able to distinguish the constituents. The following is my approximate analysis:

Silica	45.3
Iron sesquioxide	41.7
Water and organic	6.3
Lime	2.6
Undetermined	4.1
	100.0

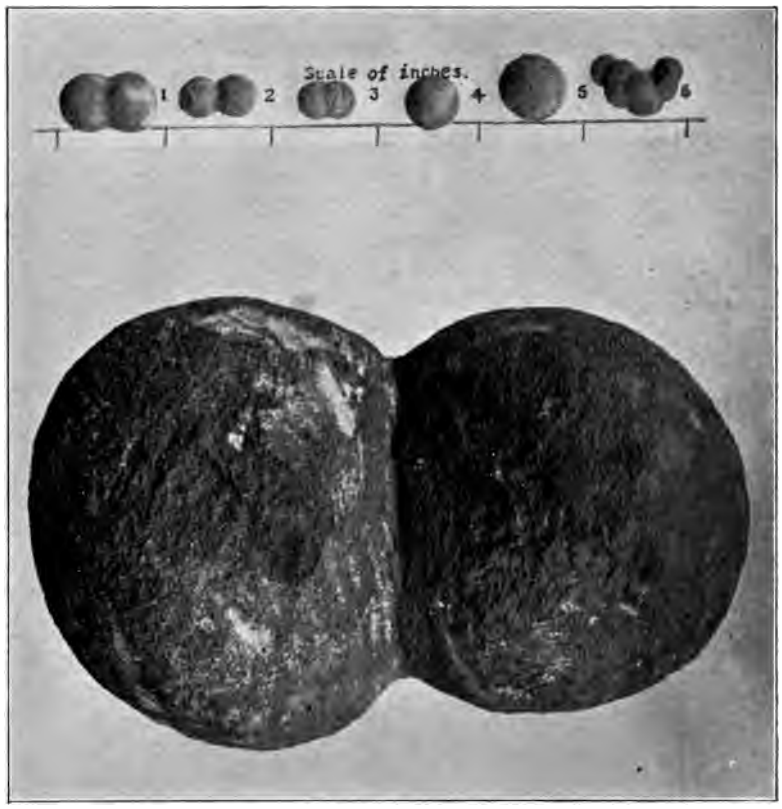

PLATE 6. NODULE RESEMBLING STONE HAMMER.

The stone hammer concretion gave similar reactions, except that the iron present was much less in quantity; its appearance under the microscope was nearly identical, except in color.

There is another source of error which it may seem almost whimsical to mention. I refer to a natural disposition on the part of miners to play practical jokes. There seems to be something in a bracing, out of door life, which causes them to relish hilarity, good humor and mirth. I have ample reason to believe that instances of this character are not so rare as might be supposed. These jokers generally practice their art on some local collector or friend in pure fun, without considering that stories sometimes lie long dormant; and when in time they return to be verified, the perpetrators dislike to admit that they were simply jests. I am aware of no instance of this character in which this has been done in malice, but always in pure fun. It is an easy thing to secrete a recent bone or an Indian stone mortar at the bottom of a deep mining shaft or in the face of a drift, to be exhumed on the advent of a scientific man at the camp, and as similar cases have been reported in California, this is a factor to be duly considered.

In view of the limited area of the table mountains and of the still more restricted drift mines, the discovery of organic remains of a human being, or a single implement in place beneath them, would be a remarkable circumstance; but to find as many as reported is next to impossible.

To realize how infrequent such discoveries must of necessity be, we have only to consider how long a time would be required to find any of the works of man in the present beds of streams, or exhausted placers, after fifty years of working.

The ruined cities of Egypt, Babylonia, Nineveh and Carthage occupy a surface but slightly changed geologically during two thousand years, while the deep gravels of California underlie a formation requiring for its deposition an interval of time which the human mind can no more realize than it can the distance to the fixed stars. Can it be doubted that the ruins mentioned will be wholly obliterated within the next fifty centuries?